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Abstract

**THE IMPORTANCE OF CONVENTIONAL AND DOPPLER
ULTRASONOGRAPHY IN THE EVALUATION OF PORTAL
HYPERTENSION IN PATIENTS WITH CIRRHOSIS OF DIFFERENT
ETIOLOGIES**

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Intoduction:

Liver cirrhosis is a chronic, progressive disease and it is usually accompanied by portal hypertension. The development of esophageal varices (EV) is one of the major complications of portal hypertension and variceal bleeding is the most life-threatening complication in liver cirrhosis. Current guidelines recommend screening for gastroesophageal varices with esophagogastroduodenoscopy in all patients when liver cirrhosis is diagnosed. Nevertheless, repeated endoscopic examinations are unpleasant for patients, and have cost impact on health care insurance. Therefore, the sensitivity and specificity of numerous non-invasive parameters have been investigated for assessment of presence and size of esophageal varices. Nowadays, ultrasonography (US) is widely available in medical practice and plays an important role in the first-line evaluation of liver cirrhosis and portal hypertension.

The present PhD thesis aims to identify non-invasive parameters based on ultrasonographic measurements that have a potential in assessment of presence and size of esophageal varices in patients with liver cirrhosis and to evaluate the usefulness of the Doppler US in the follow-up of the patients with liver cirrhosis and esophageal varices. We also investigated the relationship between the ultrasonographic changes and the severity of the portal hypertension and hepatic failure. The present study also aims to investigate changes of the ultrasound parameters after performing endoscopic therapeutic procedures for the treatment of the EV.

Material and methods:

This prospective study enrolled 162 patients admitted in the Gastroenterology service of the Emergency County Hospital Tg-Mureş or seen as outpatients between 01.09.2008 and 31.10.2011. Eligible patients were diagnosed with liver cirrhosis and had different degrees of EV, assessed with endoscopy. All patients underwent gray-scale US and Doppler US, the morning after an overnight fast. Portal vein dimension, portal flow evaluation, mean portal velocity (PVV), peak systolic (PSFV), end diastolic and mean hepatic artery velocity, resistance index of hepatic artery (HARI) and pulsatility index of hepatic artery (HAPI). and spleen size dimension were evaluated. The splenic index (SI) was calculated in square centimeters (cm²)

with the following formula: $SI = a \times b$, where a is the transverse diameter and b is the vertical diameter.

Results:

Most patients had alcoholic associated cirrhosis (55.56%) followed by viral hepatitis associated cirrhosis (34.57%). The incidence was higher in men (94 men versus 68 women).

The dimensions of the portal vein were more elevated in patients with higher degree of esophageal varices ($p=0.01$). All the 162 patients presented low portal velocity, with speed of flow in portal vein between 5.06 and 13.9 cm/sec. The mean speed was 9.46 ± 1.83 cm/sec. There was a negative correlation between the dimension and the speed of flow in the portal vein ($r=-0.24$). Our data showed that the PVV decreased while the EV degree increased and that there is a strong negative correlation between the speed of flow in the portal vein and the degree of the EV ($r=-0.79$). The data from our study suggest that in patients with liver cirrhosis the reduction of the speed of flow in the portal vein is correlated with the degree of esophageal varices ($p<0.001$).

In our patients the splenic index was between 31.44 cm² și 207.74 cm² and the mean SI was 92.61 ± 27.82 cm². Our results show a negative correlation between the portal velocity and the SI ($r=-0.61$) and a statistically significant association between the SI and the degree of esophageal varices ($p<0.0001$).

Due to anatomical and procedural difficulties from the 162 patients enrolled in our study we performed hepatic artery hemodynamic evaluation only in 85 patients. Mean PSFV in the studied sample was 65.68 cm/sec, the mean HARI was 0.81 and the mean HAPI was 1.55. There was no correlation between the PVV and the PSFV ($r=-0.07$), a negative correlation between the PVV and the HARI ($r=-0.27$) and a significant inverse correlation between the PVV and the HAPI ($r=-0.61$). In our study sample there was a significant association between the HAPI and the size of EV ($p<0.0001$) and between the HARI and the size of EV ($p=0.007$). However the PSFV did not correlate with the degree of the EV ($p=0.5$).

There were no statistical differences of the studied portal vein and hepatic artery hemodynamics to different stages of liver disease with respect to the Child-Pugh class.

In patients with recurrence of high degree EV after performing endoscopic therapeutic procedures we did not observe any statistically significant difference between PVV before and after therapy ($p=0.06$). Patients who had low-grade EV at the endoscopic re-examination after endoscopic therapy control PVV are significantly higher compared to the PVV before endoscopic therapeutic procedures ($p<0.0001$).

Conclusions:

In patients with liver cirrhosis the reduction of the speed of flow in the portal vein is correlated with the degree of esophageal varices.

In patients with cirrhosis the splenic index is correlated with the severity of the portal hypertension respectively with the portal vein velocity and the degree of esophageal varices.

In patients with cirrhosis the hepatic artery resistance and pulsatility index are correlated with the severity of the portal hypertension respectively with the degree of esophageal varices.

There is no correlation between the cirrhosis clinical grade and the alteration of portal and hepatic artery hemodynamics.

Spectral Doppler and Color Ultrasound can be a complementary method in the follow-up of portal hypertension and correlation with esophageal varices in patients with liver cirrhosis and in those patients in whom endoscopic therapeutic procedures of the EV were performed.

Keywords: liver cirrhosis, portal hypertension, Doppler ultrasound, esophageal varices